29TH ANNUAL

GRADUATE STUDENT SYMPOSIUM

JANUARY 20th and 21st 2011

USF

UNIVERSITY OF SOUTH FLORIDA

COLLEGE OF MARINE SCIENCE

The 29th Annual Graduate Student Symposium Schedule
January 20th-21st, 2011

Thursday

Time	Presenter	Title
3-3:15 pm		**Welcome**
3:15-3:30 pm	Rebekka Larson	Linking Depositional Processes to Sediment Accumulation on a Sub-Annual Scale: St. John, US Virgin Islands
3:30-3:45 pm	Robert M. Ulrich	Detection and Quantification of Enterococci using Real-Time Nucleic Acid Sequence-Based Amplification with Internal Control RNA (IC-NASBA) from Environmental Waters
3:45-4 pm	Enrique Montes	Environmental Controls on the Nitrogen Isotope Signal of Sinking Particles in the Cariaco Basin, Venezuela
4-4:15 pm	Julia P. Galkiewicz	Fungi in Lophelia, or How I Almost Quit Grad School
4:15-4:30 pm	Katie Wirt	Potential Habitat of *Acropora* spp. on Florida Reefs - Preliminary Results
4:30-4:45 pm	Christy Stephenson	Foraminifera Assemblages on Reef Rubble vs. Sediments on Conch Reef, Florida Reef Tract
4:45-5 pm	Darren Dunlap	Novel Circovirus Identified in the Calanoid Copepod *Labidocera aestiva* from Tampa Bay, Florida
5:15-6 pm		**Dinner**

Friday

Time	Presenter	Title
8-8:30 am		**Breakfast**
8:30-8:45 am	Paul Suprenand	Distribution of *Gymnosomatous* Pteropods in Western Antarctic Peninsula Shelf Waters During Austral fall
8:45-9 am	Chantale Bégin	Long-term Variation in Sedimentation Rate Over Eastern Caribbean Reefs
9-9:15 am	Dawn Goldsmith	Abundance and Diversity of Viruses Throughout the Water Column in the Northwestern Sargasso Sea
9:15-9:30 am	Brian Barnes	Improving High-Resolution SST Climatologies to Assess Cold Events in Florida Waters
9:30-9:45 am	Erica Hudson	Metabolic Adaptations to Extreme Cold in the Antarctic Krill *Euphausia superba*
9:45-10 am	Phil Thompson	Coherent Decadal Sea Level Variability in the North Atlantic
10-10:15 am	Candice Simmons	Assessing the Presence and Distribution of Polybrominated Diphenyl Ethers in Hillsborough Bay, a Northeastern region of Tampa Bay, FL
10:15-10:30 am	Ryan Lloyd	Using Remote Sensing to Search for Garbage in the Pacific Ocean
10:30-10:45 am		**Break**
10:45-11 am	Elizabeth Brown	Initial Deglaciation of the Laurentide Ice Sheet based on Gulf of Mexico Sediments
11-11:15 am	Kara Radabaugh	$\delta^{13}C$ and $\delta^{15}N$ Variation in Fish and Primary Producers: An Isoscape Perspective for the West Florida Shelf
11:15-11:30 am	Robert Hardy	Spatial and Temporal Distributions of *Sargassum* Dominated Surface-pelagic Drift Communities in the Northern Gulf of Mexico During 2010
11:30-11:45 am	Butch Ringelspaugh	Comparison of the Effects of Ocean Acidification on the Three Acroporids of the Caribbean/Atlantic, Elkhorn Coral (*Acropora palmata*), Staghorn Coral (*Acropora cervicornis*), and Fused Staghorn Coral (*Acropora prolifera*), Utilizing Ex-Situ Techniques

11:45-12pm	Jessica Makowski	Using Ocean Bottom Pressure from GRACE to Understand Transport Variations of the Antarctic Circumpolar Current
12-12:15 pm	Daniel Sensi	Optical Properties of Various Materials and Organisms in the Ocean
12:15-12:30 pm	Claudia C. Baron-Aguilar	Influence of Temperature on Yolk Sac Resorption of *Centropomus undecimalis* Larvae in a Controlled Laboratory Environment
12:30-1:30 pm		**LUNCH-Fortunato's Pizza**
1:30-1:45 pm	Ana A. Arellano	Investigation of Inputs of Carbon, Nutrients, and Groundwater in Coastal Florida Using Colored Dissolved Organic Matter
1:45-2 pm	Holly Rolls	Defining Fish Nursery Habitats of *Centropomus undecimalis* Using Otolith Elemental Fingerprinting
2-2:15 pm	Monica Wilson	Wavelet Analysis of Synoptic Variability in Tampa Bay, FL
2:15-2:30 pm	Maria Vega-Rodriguez	Developing High-resolution SST Climatologies and Thermal Stress Indices to Enhance NOAA's Coral Reef Decisional Support System.
2:30-2:45 pm	Carrie Wall	Spatial and Temporal Variability of Red Grouper Habitat within Steamboat Lumps Marine Reserve, Gulf of Mexico
2:45-3pm	Mark Patsavas	High Precision Carbon System Measurements: Methods, Improvements, and Polar Bears
3-3:15 pm		**Break**
3:15-3:30 pm	Lindsey Flynn	Thermal Determinants of Nest Site Selection in Loggerhead Turtles, *Caretta caretta*, at Casey Key, Florida
3:30-3:45 pm	Suzanne Stickley	Kinetic Characteristics of LDH in Polar and Subtropical Fishes: A Comparison.
3:45-4 pm	Yingli Zhu	Observation and Simulation Study of Two Cold-air Outbreak Snowstorms over Shandong Peninsula of China
4-4:15 pm	Beth Young	Gene Transfer Agents' Effect on Coral Larval Settlement
4:15-4:30 pm	Monica M. Cook	Electrocoagulation Technology For Removal of Biochemical Contaminants from Wastewater Treatment Plant Samples
4:30-4:45 pm	Leslie Schwierzke-Wade	Assessment of fertility potential in the bottlenose dolphin (*Tursiops truncatus*): Application of an ELISA-based biomarker analysis
4:45-5 pm	Patrick Schwing	Controls of Heavy Metal Distribution in the Manatee River Watershed, FL Over the Last One Hundred Years
5-7 pm		**TGIF**

Linking depositional processes to sediment accumulation on a sub-annual scale: St. John, US Virgin Islands.

Rebekka A. Larson[1,2], Gregg R. Brooks[2], Barry Devine[3], Patrick Schwing[1], Charles Holmes[2], Gert-Jan Reichart[4] and Els Van Soelen[4]

[1]College of Marine Science, University of South Florida; [2]Eckerd College, St. Petersburg, FL; [3]Tropical Consultants Inc., US Virgin Islands; [4]University of Utrecht, The Netherlands

Beryllium-7 and elemental analyses were utilized on mm-scale laminated sediment records from coastal salt ponds in the US Virgin Islands (USVI) to determine terrigenous sediment accumulation during the annual dry/wet seasons. This provides a framework for comparing natural terrigenous sediment accumulation and how and to what magnitude anthropogenic activities in upslope watersheds may alter terrigenous sediment accumulation in coastal environments. Sediment cores collected in salt ponds, along the coast of St. John, consisted of well-preserved mm to cm-scale laminations and provide a high-resolution record of variations in sediment sources (terrigenous, marine, atmospheric) and depositional processes (rainfall/runoff, marine overwash).

Terrigenous sedimentation has been linked to intense rainfall events, which occur at greater frequency during the wet season. Historical daily rainfall and elemental scanning show that terrigenous sedimentation is greater during periods when there are more frequent intense rainfall events that exceed a rainfall threshold (minimum rainfall required for sediment to erode and be transported downslope). Analysis of ^{7}Be to calculate Mass Accumulation Rates (MAR) also shows lower MAR during the dry season and an increase in MAR as rainfall/runoff increased during the wet season (May/June and Sept./Oct./Nov). High-resolution scanning XRF and scanning LA-ICP-MS provide elemental composition of sediments reflecting an increased terrigenous sediment accumulation (laminae with higher Al, Ti, Fe, Cu, and Si) associated with heavy rainfall events during the wet season.

These sediment records provide information about terrigenous sediment runoff on seasonal/annual scales, which can be used to help correlate the amount of sediment runoff with rainfall. This can provide crucial information about rainfall patterns that are important for human populations and runoff patterns that are important for coastal ecosystems on pertinent time-scales (annual and decadal) as well as how anthropogenic activities may have altered these patterns.

Program Start Date: Spring 2008
MS, expected Summer 2011
Advisor: Dr. Albert Hine
Sedimentology Laboratory
Concentration: Geological Oceanography

Detection and Quantification of Enterococci using Real-Time Nucleic Acid Sequence-Based Amplification with Internal Control RNA (IC-NASBA) from Environmental Waters

Robert M. Ulrich[1] and John H. Paul[1]

[1]University of South Florida, College of Marine Science

Waterborne pathogenic microorganisms pose a significant risk to human health. Elevated enterococci levels in marine and estuarine waters have been correlated with human illness in exposed individuals, making members of this genus useful indicators of the presence waterborne pathogens. Management of coastal waters important for recreation and seafood production has been historically undertaken by monitoring fecal coliform and enterococci concentrations by standard membrane filtration techniques. However, these techniques take between 24-48 hours post-sampling to generate useful data, allowing a significant lag in time for humans to be exposed to impacted water while management decisions are being made. We are currently in the process of developing a real-time nucleic acid sequenced-based assay with internal control RNA (IC-NASBA) that can be used to detect and quantify enterococci in the field in less than one hour. We have identified a region of the large subunit ribosomal RNA gene that is specific to enterococci, and have designed a complimentary NASBA primer pair and molecular beacon for use in real-time NASBA. We have also designed an internal control in vitro transcript RNA that is used to eliminate the incidence of false negatives, as well as increasing the precision of quantification. This assay has been adapted to be used in situ by incorporating a field-able RNA extraction method as well as the use of a portable, heated fluorometer for the simultaneous detection of fluorescence from amplification of target RNA and IC-RNA at two separate wavelengths. The assay was able to detect numerous environmental isolates of enterococci while showing no cross-reactivity when tested against closely related organisms. We are able to detect RNA from as few as 10 cells with a dynamic range spanning four orders of magnitude.

Program Start Date: Fall 2010
PhD, expected Fall 2013
Advisor: Dr. John Paul
Marine Microbiology Group
Concentration: Biological Oceanography

Environmental Controls on the Nitrogen Isotope Signal of Sinking Particles in the Cariaco Basin, Venezuela

Enrique Montes[1], F.E. Muller-Karger[1], R. Thunell[2], E. Tappa[2], L. Trocoli[3], L. Lorenzoni[1], Y. Astor[4] and R. Varela[4]

[1]College of Marine Science, University of South Florida; [2]Department of Geological Sciences, University of South Carolina; [3]Universidad de Oriente, Venezuela; [4]Fundación La Salle de Ciencias Naturales, Venezuela.

The isotopic composition of particulate nitrogen (δ^{15}N-PN) of marine sediments has become an important paleoclimatic proxy because of its potential for providing information about past changes in the nitrogen budget of the global ocean. We report here a decade of δ^{15}N from sinking particles in the Cariaco Basin, an anoxic depression off Venezuela that preserves an exceptional climate record in the sediments. We found that the δ^{15}N-PN responds to the seasonal upwelling cycle of the basin and to interannual climate variability over larger spatial scales. Particles produced during the spring upwelling period carry a nitrogen fixation signal imported from the Sub-tropical North Atlantic, while the δ^{15}N-PN in the relaxation period (September to November) seems to respond to local nitrogen fixation. The spring bloom δ^{15}N-PN is also strongly coupled to interannual changes in sea surface temperature, which is a proxy of upwelling strength. These findings indicate that the δ^{15}N-PN in the sediments of the Cariaco Basin need to be interpreted cautiously in the context of the role of climate change on sea level variations and the nutrient budget of the basin.

Program Start Date: Fall 2009
PhD, expected Summer 2011
Advisor: Dr. Frank Muller-Karger
Institute of Marine Remote Sensing
Concentration: Geological Oceanography

Fungi in *Lophelia* or How I Almost Quit Grad School

Julia Galkiewicz[1], Sarah Stellick[2], Michael Gray[3] and Christina Kellogg[3]

[1]College of Marine Science, University of South Florida; [2]University of South Florida, St. Petersburg; [3]U.S. Geological Survey, St. Petersburg, FL

The coral holobiont consists of the cumulative genomes of the coral host and all associated microbiota, including bacteria, archaea, and microeukaryotes. Determining the eukaryotic members of the microbial community using culture-independent techniques has been difficult because 18S rDNA primers are often overwhelmed by the abundance of coral genetic material in DNA extractions. Fungi are recognized members of the coral holobiont, found associated with tissue and skeleton in healthy and diseased shallow water corals. Culture-based methods were employed in this study to isolate fungi, allowing further investigation and characterization of these under-sampled holobiont members.

Branches of the cold-water coral *Lophelia pertusa* were collected by submersible form two sites in the western Atlantic at depths greater than 400m. Individual coral samples were kept isolated and insulated during ascent. Immediately after collection, a homogenate of the coral tissue, skeleton, and mucus was plated onto Orange Serum Agar, a low pH media. Plates were maintained at 4˚C to mimic *in situ* temperatures and allowed to grow for several months. Visible colonies were picked and streaked to isolation on glycerol artificial seawater agar (GASWA). Light microscopy of the cultures showed that they were non-filamentous, budding cells, although the ploidy of the cells or stage in sexual reproduction is unknown. Isolates were further characterized by 18S rDNA amplification and sequencing. The sequences revealed a closely related cluster of basidiomycete fungi obtained from different coral colonies at both sites.

These are the first fungi to be cultured and characterized from an apparently healthy deep-sea coral. To date, the only reported fungi in deep-sea corals are endolithic fungi associated with dead coral skeleton. It remains to be determined what symbiotic role these fungi play in the coral holobiont.

Program Start Date: Fall 2006
PhD, expected Fall 2011
Advisor: Dr. Pamela Hallock Muller
Marine Microbiology, USGS
Concentration: Biological Oceanography

Potential Habitat of *Acropora* spp. on Florida Reefs – Preliminary Results

Katie Wirt[1], Pamela Hallock Muller[1] and David Palandro[2]

[1]College of Marine Science, University of South Florida; [2]Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission

Elkhorn and Staghorn corals (*Acropora palmata, A. cervicornis)* are two species listed as threatened under the Endangered Species Act (ESA), and have been since 2006. The threatened status of these two species is particularly important because of the vital role they play in reef communities. The ultimate goal of this study is to build a potential habitat map of *A. palmata* and *A. cervicornis* distribution in South and Southeast Florida. The determination of potential habitat will aid in the efforts of conservation and potential restoration throughout the Florida Keys. These observations will be made by combining *in situ* observations with mapped benthic habitat and bathymetry maps as well as with historical data. Preliminary results reveal a range of benthic habitats these two species have been observed to occupy, including roughly 10% of observations located in areas mapped as seagrass. The results of this research will be used to predict where conservation actions are likely to be most effective. Once likely habitats are defined, the results will also aide in limiting destruction or modification of habitats in which these species are able to live.

Program Start Date: Fall 2009
MS, expected Summer 2011
Advisor: Dr. Pamela Hallock Muller
Reef Indicators Laboratory
Concentration: Biological Oceanography

Foraminifera Assemblages on Reef Rubble vs. Sediments on Conch Reef, Florida Reef Tract

Christy M. Stephenson[1] and Pamela Hallock Muller[1]

[1]College of Marine Science, University of South Florida

Benthic foraminiferal assemblages are widely used to illuminate responses of the benthic communities to environmental stresses or conditions, including, temperature, anthropogenic pollutants including nutrient input, changes in salinity and solar radiation. Studies of larger reef-dwelling foraminifers have revealed their utility in all subtropical/tropical oceans. Foraminifers have been even more widely used as biostratigraphic and paleoenvironmental indicators because their shells are commonly preserved in sediments and sedimentary rocks. An understanding of how the total fossil assemblage differs from the living assemblage is essential for informed paleoecologic reconstructions, including interpreting recent environmental changes as reflected in sediment cores.

Our study compares epibiotic foraminiferal assemblages with those from sediments at Conch Reef, Florida reef tract. Conch Reef is the site of the Aquarius underwater habitats research facility and includes areas protected and used only for scientific studies. Taxa with more robust shells tend to be more common in well sorted sands while smaller taxa are in finer sediments. Attached taxa are much less common in the sediments than attached to hard substrata; attached taxa tend to be much more common in sediments where seagrass and other macrophytes provide temporary substratum. The sediment-rubble assemblage comparison will contribute to the ongoing debates concerning how representative assemblages from sediment samples are of overall assemblages in an area and specifically what taxa tend to be over- or under-represented in reef-sand samples. When completed a species list will be compiled and contribute to biodiversity assessments for Conch Reef, Florida reef tract.

Program Start Date: Fall 2006
MS, expected Spring 2011
Advisor: Dr. Pamela Hallock Muller
Reef Indicators Laboratory
Concentration: Biological Oceanography

Novel Circovirus Identified in the Calanoid Copepod *Labidocera Aestiva* from Tampa Bay, Florida

Darren Dunlap[1], Terry Fei Fan Ng[1], Ian Hewson[2] and Mya Breitbart[1],

[1]College of Marine Science, University of South Florida;
[2]Cornell University, Ithaca, NY

Mesozooplankton are critical components of marine food webs as the primary consumers of phytoplankton, as prey for upper trophic level predators including commercially important fish, and by mediating carbon transfer from the atmosphere to the ocean interior through fecal matter deposition. Thus, the factors that control population dynamics of zooplankton are critical to understanding the structure and function of marine food webs. Two decades of research on marine viruses have demonstrated their profound effects on all levels of marine life from bacteria to whales. Despite the ecological importance of zooplankton, virtually nothing is known about the impact of viruses on the most abundant zooplankton group – the copepods. Here we present the complete genome sequence of a circovirus identified using viral metagenomics of a calanoid-copepod-dominated zooplankton tow from Tampa Bay, Florida. The single-stranded DNA copepod circovirus genome is 1764 nt long, and displays only weak amino-acid level identities to known avian circoviruses. The copepod circovirus is similar in genome organization and replication gene sequence to a circovirus recently identified from a virioplankton metagenome from the Chesapeake Bay. Quantitative PCR for the circovirus replication gene demonstrated 100% prevalence with viral loads of 10^5-10^6 copies per *Labidocera aestiva* individual. Much lower viral concentrations were detected in bulk zooplankton tow samples and other copepod species from Tampa Bay, and the circovirus was not detected in zooplankton collected from Shoals Marine Lab in Maine. Further studies are required to understand the relationship between the circovirus and *Labidocera*, including the route of infection, prevalence, and viral effects on the host.

Start Date: Fall 2009
MS, expected Spring 2012
Advisor: Dr. Mya Breitbart
Breitbart Lab
Concentration: Biological Oceanography

Distribution of Gymnosomatous Pteropods in Western Antarctic Peninsula Shelf Waters During Austral fall

Paul M. Suprenand[1] and J.J. Torres[1]

[1] University of South Florida, College of Marine Science

The present study provides the first detailed information on the distribution of gymnosomatous pteropods over a wide latitudinal gradient along the western Antarctic Peninsula during the Austral fall. Both gymnosomatous species, *Spongiobranchaea australis* and *Clione limacina antarctica*, were captured in Multiple Opening and Closing Net and Environmental Sampling System (MOC-10) trawls aboard the Research Vessel Ice Breaker, Nathaniel B. Palmer, at a series of six sites ranging from Charcot Island in the south to Joinville Island in the north. The pteropod species *Spongiobranchaea australis* has been thought to primarily inhabit waters north of the Polar Front, whereas *Clione limacina antarctica* is considered a true Antarctic species, residing in waters south of the convergence. *Spongiobranchaea australis* was captured in every sampling site along the cruise track, whereas *Clione limacina antarctica* was captured mostly in more southern sampling sites. Hydrographic data provided by CTD casts indicates increasing shelf water temperatures along the western Antarctic Peninsula, which corresponds to and increased abundance of *Spongiobranchaea australis*, suggesting a decrease in habitable environments for true Antarctic species.

Program start date: Summer 2008
PhD, expected 2012
Advisors: Dr. Pamela Hallock Muller & Dr. Benjamin Flower
Reef Indicators Lab
Concentration: Biological Oceanography

Long-Term Variation in Sedimentation Rate over Eastern Caribbean Reefs

Chantale Bégin[1] and Isabelle Côté[1]

[1]Department of Biological Sciences, Simon Fraser University, Burnaby, BC, Canada

Coral reefs are severely degraded in the Caribbean owing, in part, to chronic stressors that originate from land. Sedimentation is believed to be an important factor affecting coral reef health, yet techniques most often used to measure sedimentation rate are inadequate. Consequently, our understanding of changes in sediment yield to the coastal zone as a result of development in upstream watersheds is still limited. We used sediment cores to quantify temporal changes in sedimentation rate and composition over coral reefs of five islands in the eastern Caribbean, with a special focus on Saint Lucia. There was a significant increase in the proportion of terrigenous sediment over time at 6 of 11 sites. These 6 sites were located near identifiable upstream disturbances. Radioisotope analysis of a Saint Lucia core indicated very high sedimentation rates (up to 1.2g/cm^2/year) near reefs. Peaks in deposition rates of calcareous and terrigenous sediment over 35 years were generally synchronized, suggesting that large storms are more important in driving the yearly variability of deposition rate than human-made disturbances in the watershed. Despite this storm-induced variability, we detected an increase in terrigenous sediment accumulation over time that can likely be attributed to changes in the watershed. We suggest that sediment composition analyses are an essential complement to rate estimates to monitor effectively temporal changes in sediment delivery to coral reefs.

Program Start Date: Fall 2008
PhD, expected Spring 2012
Advisor: Dr. Isabelle Côté
Tropical Marine Ecology Lab, Simon Fraser University

Biogeography of marine viruses as revealed through sequencing of PhoH,a novel signature gene involved in phosphate metabolism

Dawn B. Goldsmith[1], Giuseppe Crosti[1], Lauren D. McDaniel[1], Bhakti Dwivedi[1], Rachel Parsons[2], Craig Carlson[3], Curtis A. Suttle[4], Markus G. Weinbauer[5], Ruth-Anne Sandaa[6] and Mya Breitbart[1]

[1]University of South Florida, College of Marine Science; [2]Bermuda Institute of Ocean Sciences, St. George's, Bermuda; [3]University of California at Santa Barbara, Santa Barbara, CA; [4]University of British Columbia, Vancouver, British Columbia, Canada; [5]Laboratoire d'Océanographie de Villefranche, Université Pierre et Marie Curie, Villefranche-sur-Mer, France, and CNRS, Laboratoire d'Océanographie de Villefranche, Villefranche-sur-Mer, France; [6]University of Bergen, Bergen, Norway

Viruses play a key role in the marine environment because they regulate the transfer of energy between trophic levels and influence global carbon and nutrient cycles. Studies have revealed tremendous diversity of marine viruses, but viral communities remain difficult to characterize because of the lack of a signature gene common to all viruses. Studies of phage (viruses that infect bacteria) have shown the presence of host metabolic genes in phage genomes, such as PhoH, a gene in the Pho regulon. While the exact function of PhoH itself is unknown, in general the genes of the Pho regulon control the uptake and metabolism of phosphate by a cell in response to phosphorus limitation. The role of PhoH in a phage genome is not yet clear, but it is possible that the expression of the phage PhoH gene during infection might enable a host to continue to take up phosphate during infection, allowing the virus to replicate further before lysing the host cell.

The goal of this project is to gain a better understanding of the diversity of viruses in the Northwestern Sargasso Sea and worldwide by using PhoH as a signature gene. A portion of the PhoH gene was amplified and sequenced from marine virus samples collected from locations around the world, as well as a detailed depth profile sampled in one location in the Sargasso Sea. Phylogenetic analysis demonstrates five distinct PhoH groups amongst the marine virus sequences. Although most of the groups are represented at most geographical locations sampled, each location has a different PhoH profile. Similarly, the depth analysis in the Sargasso Sea shows that each of the studied depths contains members of most or all of the clusters. However, the 100 m viral community is distinct from that of the other depths. This is noteworthy because direct counts of viruses at this site for the past ten years have shown an annually recurring peak in viral abundance in late summer at a depth of 80-100 m.

Program Start Date: Fall 2007
PhD, expected Summer 2012
Advisor: Dr. Mya Breitbart
Breitbart Lab
Concentration: Biological Oceanography

Improving High-Resolution SST Climatologies to Assess Cold Events in Florida Waters

Brian B. Barnes[1], Chuanmin Hu[1], and Frank Muller-Karger[1]

[1]College of Marine Science, University of South Florida

Assessing thermal stress in marine environments over large regions requires accurate measurement of sea surface temperature (SST) from satellite sensors, including the NOAA AVHRR and NASA MODIS. A cloud filter for such data has been developed by examining the long- and short-term variability of SST for the Florida peninsula between 1993 and 2010 at 1 km resolution. This method is effective for removing clouds in most images, yet during anomalously low temperature events, valid SST data can be misidentified as clouds and discarded.

In response to the cold event in January, 2010, the existing AVHRR-derived SST images for the month of January, 1995-2010, and spanning the waters surrounding Florida (24 to 31 N, 79 to 86 W) were re-examined. Of the 2,703 images analyzed, the cloud filter underperformed in 498 images (18.2 %). The majority these improperly filtered images were from passes during cold events, yet some warm data were sometimes also incorrectly masked.

The images containing erroneous masking were re-processed with both cloud-filtering and manual delineation. Weekly climatologies created with reprocessed images showed 0 - 2 °C lower SST than the original climatologies. The most extreme deviations occurred at inshore pixels, especially in the Florida Bay and Big Bend regions. Although the manual filtering method developed for this study is impractical for widespread implementation, it nonetheless represents the best high-resolution SST climatology and highlights the need for improved autonomous cloud-masking techniques.

Program Start Date: Fall 2009
PhD, expected 2013
Advisor: Dr. Chuanmin Hu
Optical Oceanography Lab
Concentration: Physical/Biological Oceanography

Metabolic adaptations to the extreme cold in the Antarctic Krill *Euphausia superba*

Erica Hudson[1] and Jose Torres[1]

[1] College of Marine Science, University of South Florida

Whole animal respiration measurements along with metabolic enzyme activity levels and proximate composition data were used to elucidate the metabolic poise of *Euphausia superba* in waters of the Western Antarctic Peninsula shelf in the early fall (Mar-Apr) of 2010. Three enzymes representing two important intermediary metabolic pathways were chosen to corroborate the measurements of whole animal metabolism: citrate synthase (CS), malate dehydrogenase (MDH) (aerobic pathway) and lactate dehydrogenase (LDH) (anaerobic pathway) . Muscle proximate composition data (percent water, percent protein, percent lipid, and protein as a percentage of wet mass) were used as general indicators of condition. Whole animal metabolism observed in the early fall period sampled during the present study was comparable to fall-winter rates obtained during the later fall (April-May) time-frame sampled during SO GLOBEC, suggesting that the transition to winter metabolism in *E. superba* occurs in early March. Whole animal respiration was mirrored in the activities of the CS, MDH, and LDH.

Program start date: Spring 2009
PhD expected 2012
Advisor: Dr. Jose Torres
Physiology Lab
Concentration: Biological Oceanography

Coherent decadal sea level variability in the North Atlantic

Philip R. Thompson[1] and Gary T. Mitchum[1]

[1]College of Marine Science, University of South Florida

Tide gauge sea level variability at periods greater than annual is in phase and highly coherent along the western boundary of the North Atlantic from Texas to Nova Scotia. In addition, we find sea level in the western Atlantic is coherent and out of phase with sea level along the eastern boundary of the Atlantic. The coherence is primarily due to variability in two frequency bands. The first is a narrow band around 14 months, which we attribute to the pole tide associated with the Chandler Wobble, and the second is a decadal band. Decadal sea level variability in the western Atlantic is most often associated with open ocean wind-curl forcing and long Rossby waves, but we believe this mechanism is insufficient to explain the large meridional scale and cross-gyre nature of the coherence. A linear regression of North Atlantic sea surface temperature onto the coherent sea level signal shows a basin-wide pattern of sea surface temperature, which is suggestive of a basin-scale decadal climate mode. The possibility of such a mode motivated us to look for model output consistent with our observations. The sea surface height (SSH) output from the GECCO model is significantly correlated with the tide gauge observations and reproduces the coherent nature of SSH in the North Atlantic. We are currently diagnosing the forcing and output of the GECCO model to assess how the model produces SSH fields consistent with the tide gauge observations.

Program start date: Fall 2005
PhD, expected Summer 2011
Advisor: Dr. Gary T. Mitchum
Laboratory: Gary's Lab
Concentration: Physical Oceanography

Assessing the Presence and Distribution of Polybrominated Diphenyl Ethers in Hillsborough Bay a Northeastern Region of Tampa Bay, FL

Candice Simmons[1], Foday Jaward[2]and Ashanti Johnson[1]

[1]College of Marine Science, University of South Florida;
[2]Department of Environmental and Occupational Health, College of Public Health, University of South Florida

Polybrominated diphenyl ethers (PBDEs) are a widely used class of flame retardants that are important sources for contamination in the marine environment. Sediments serve as a sink for PBDEs due to their large sorption capacity, and concentrations of PBDEs in sediments are related to coastal population density. Hillsborough Bay, a northeastern region of Tampa Bay, FL, is surrounded by a large urban area, supports extensive industrial activity and a major shipping port. This study examines the presence and distribution of PBDEs in Hillsborough Bay to determine the extent of pollution, identify sources, and possible management strategies. A total of 50 sediment surface samples were collected from Hillsborough Bay and two of its major tributaries to assess the presence and distribution of 8 routinely detected PBDE congeners. Samples were soxhlet extracted, cleaned up on a florisil: alumina: silica gel column and extracts were analyzed by gas chromatography/ electron capture detector (GC-ECD). In this study we report the first attempt to present data and distributions of PBDEs in terms of sample location, grain size and organic matter content in this region.

Program Start Date: Summer 2007
PhD, expected Spring 2012
Advisor: Dr. Ashanti Johnson
Radiogeochemistry Laboratory
Concentration: Chemical Oceanography

Using Remote Sensing to Search for Garbage in the Pacific Ocean

Ryan Lloyd[1], Daniel Sensi[1] and Chuanmin Hu[1]

[1]College of Marine Science, University of South Florida

Various forms of garbage exist in the major ocean, yet due to technical difficulties our knowledge on their distribution and temporal changes is practically nonexistent. Here we will use the state-of-the-art satellite technology and algorithms to attempt to answer the following two questions: 1) Can we detect the garbage distributions near the Pacific Gyre? 2) If the answer is yes, how do they change over time and space? We will analyze thousands of MODIS high-resolution (250-m) images from 2002 to 2010 in various areas in the Pacific Ocean where previous studies based on ship and airborne survey have discovered macroscopic patches of garbage in the upper water column. To reduce the huge amount of images and data to a manageable amount, an RGB image was created and screened for cloudiness. Next, data with the least cloudcover were further processed to generate a Floating Algae Index (FAI) image and a color index (CI) image. The former shows and potential algae or any materials floating on the water surface, while the latter indicates phytoplankton abundance in the water column. The three images were then visualized and compared to one another, and any anomalies found in the images were noted for closer examination using the MODIS spectral data. The exploration work may generate unique information on the garbage distribution that cannot be obtained otherwise.

Program start date: Fall 2010
MS, expected Fall 2013
Advisor: Dr. Chuanmin Hu
Optical Oceanography Laboratory
Concentration: Physical & Biological Oceanography

Initial Deglaciation of the Laurentide Ice Sheet Based on Gulf of Mexico Sediments

Elizabeth A. Brown[1], Benjamin P. Flower[1], Carlie Williams[1] and Ethan Goddard[1]

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We investigate initial melting of the Laurentide ice sheet (LIS) into the Gulf of Mexico at the end of the last glacial maximum. Specifically, we examine the timing of LIS meltwater with respect to the "early" deglacial warming of the Antarctic (~19-17 kyr), and the "late" deglacial warming of Greenland (~14.7 kyr) ice sheets. While the polar air temperature records appear to be asynchronous, records of mountain glacier retreat from New Zealand, Wyoming, Montana, and other areas suggest an earlier and synchronous mid-latitude warming, closer to that of Antarctic warming. Placing LIS retreat into this global perspective is critical to understanding the coherence of interhemispheric warming.

Samples of the planktic foraminifer *Globigerinoides ruber* (pink) were picked at 500-year intervals between 23 and 10 kyr, from gravity core MD50-2550 in the anoxic Orca Basin. Age control is based on over forty-five AMS ^{14}C dates on monospecific *G. ruber* samples. Paired Mg/Ca and $\delta^{18}O$ are used to calculate $\delta^{18}O$ seawater, a proxy for salinity. Salinity can be estimated using $\delta^{18}O$ sw/S relationships generated for the deglacial Gulf of Mexico, based on an assumed $\delta^{18}O$ composition for the LIS as the low-salinity end-member. Preliminary Mg/Ca data suggest that initially (23-18 ka), SST appears to have mirrored the Greenland records. This ended with an abrupt cooling at 18.3 ka. However, during the Oldest Dryas, SST exhibited a sharp warming trend much like that of EPICA Dome C & D in Antarctica. Preliminary $\delta^{18}O$ sw data suggest that by 20 ka, meltwater was entering the Gulf of Mexico, at least seasonally. Implications for initial LIS ablation closer to the "early" deglacial warming of Antarctica and the mid-latitude mountain glaciers may be consistent with increased northern hemisphere insolation, enhanced by greenhouse gas forcing.

Program Start Date: Fall 2009
MS, expected Summer 2011
Advisor: Dr. Benjamin Flower
Paleoceanography Laboratory
Concentration: Geological Oceanography

Variation in fish $\delta^{13}C$ and $\delta^{15}N$ on the West Florida Shelf: Implications for site fidelity and selective trophic pathway effects.

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Climatic gradients, water depth, and geographic variations in river discharge impart spatiotemporal heterogeneity to the stable-isotope baselines of coastal food webs. This baseline variation increases the utility of stable-isotope maps, or "isoscapes," by providing new spatial and temporal perspectives on the site fidelities of motile marine organisms and the dominant primary production pathways that support their biomass. SEAMAP groundfish surveys at more than 130 locations on the West Florida Shelf (eastern Gulf of Mexico) were used to acquire more than 1,400 fish and invertebrate specimens for analysis of bulk-tissue $\delta^{13}C$ and $\delta^{15}N$. The first West Florida Shelf isoscape, which was completed during summer 2009, revealed strong isotopic trends along latitudinal, longitudinal, and depth gradients. $\delta^{15}N$ composition revealed site fidelities were generally high for these trawl-caught fishes. Benthic microalgae from sea urchin stomachs was enriched in ^{13}C relative to phytoplankton, providing a marker for trophic pathways that originate from benthic primary producers. Some fish species (e.g., littlehead porgy, *Calamus proridens*) appear to obtain nearly all of their biomass via benthic primary production, whereas others (inshore lizardfish, *Synodus foetens*, and dusky flounder, *Syacium papillosum*) derive their biomass from a combination of benthic and planktonic primary producers. This suggests that variation in the benthic light environment will have a selective effect on the production of fish biomass.

Start Date: Fall 2008
PhD, expected 2012
Advisor: Dr. Ernst Peebles
Paleoceanography Lab/Estuarine Ecology Lab
Concentration: Biological Oceanography

Spatial and temporal distributions of *Sargassum* dominated surface-pelagic drift communities in the northern Gulf of Mexico during 2010

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Surface pelagic drift communities in the Gulf of Mexico serve as critical developmental habitats for neonate sea turtles, as well as many species of pelagic fish. This ephemeral ecosystem is typically dominated by the pelagic macroalgae *Sargassum* spp. The highly dynamic nature of this habitat makes it difficult to locate and quantify directly. To identify and measure this habitat remotely, we analyzed data from Earth-observing satellites. We applied the Floating Algae Index (FAI), developed by Hu (2009), to 30-m resolution Landsat TM and ETM+ imagery from the northern Gulf of Mexico. This effort provides the first high-resolution quantification of the spatiotemporal distribution of *Sargassum*-dominated drift communities in the region, which includes the BP MC 252 oil spill area, April—August 2010. The FAI identifies the presence *Sargassum* based on difference between reflectance at band 4 (825 nm) and a linear baseline interpolated between bands 3 (660 nm) and 5 (1650 nm). We searched all available Landsat scenes collected in 2010 over the northern GOM waters for the presence of *Sargassum*. Pixels exhibiting high FAI values were digitized semi-automatically, and results were summarized in a spatial database. Our results show that *Sargassum* is present earlier in the year and in higher amounts in the northwestern Gulf of Mexico (off the Texas coast) than in the central and eastern GOM, where *Sargassum* appeared in late spring and persisted into the winter. The results also show persistent *Sargassum* lines and patches throughout the West Florida shelf during summer and fall. These results provide a synoptic measure of surface pelagic habitat availability, which may serve as baseline data to understand and quantify potential impacts of climate change and natural disasters (e.g., oil spills) on the GOM ecosystem.

Program Start Date: Spring 2009
MS, expected Spring 2012
Advisor: Dr. Chuanmin Hu
Optical Oceanography Laboratory
Concentration: Biological Oceanography

Comparison of the Effects of Ocean Acidification on the Three Acroporids of the Caribbean/Atlantic, Elkhorn Coral (*Acropora palmata*), Staghorn Coral (*Acropora cervicornis*), and Fused Staghorn Coral (*Acropora prolifera*), Utilizing Ex-Situ Techniques

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Although the title of this presentation sets the tone for a single focus, there are actually several layers to this project, all aimed towards research and conservation of the only three acroporids of the Caribbean/Atlantic, Elkhorn Coral (*Acropora palmata*), Staghorn Coral (*Acropora cervicornis*), and Fused Staghorn Coral (*Acropora prolifera*), through ex-situ practices. As a base component for this project, a review of known practitioners keeping live *A. palmata* and *A. cervicornis* is being conducted to write a guidance document based on best husbandry practices and methodologies for successful care of Caribbean/Atlantic acroporids. Utilizing the information gathered from the participants, the second goal is to design and construct a multipurpose mesocosm aquarium system for studying the effects of climate change on zooxanthellate reef building corals, and educating the general public through exhibition at The Pier Aquarium, soon to be known as The Marine Discovery Center and Aquarium. Finally, we want to observe any differences between how *A. palmata*, *A. cervicornis*, and *A. prolifera* react to elevated pCO2 levels, coupled with thermal stress.

Zooxanthellate stony corals like the Caribbean/Atlantic acroporids are known as holobionts, meaning there are several organisms that make up a single coral colony. Two of the more familiar organisms are the coral polyp and the symbiotic algae called zooxanthellae. Each of these organisms is comprised of multiple genotypes, and clades for the latter, of which any one genotype or clade may prefer certain environmental conditions over others. It is the synergy between the coral polyp and zooxanthellae that allow a coral colony to grow and thrive in a given habitat. By studying the effects of ocean acidification on these three species, which includes several known coral and zooxanthellae genotypes and clades, we will gain a better understanding for the implications of increased pCO2 levels in the ocean on their calcification rates, genetic diversity, and survival.

Program Start Date: Spring 2010
MS, expected Spring 2012
Advisor: Dr. Pamela Hallock Muller
Aquarium Laboratory
Concentration: Biological Oceanography

Using Ocean Bottom Pressure from GRACE to Understand Transport Variations of the Antarctic Circumpolar Current

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Little is known of the low frequency variability of barotropic transport in the Antarctic Circumpolar Current (ACC) outside of the Drake Passage, except from limited repeat hydrographic sections and model output. ACC transport can be measured directly by differencing bottom pressure (BP) data from the North and South sides of the current. Zlotnicki et al (2005) used bottom pressure measurements from the Gravity Recovery and Climate Experiment (GRACE) to compute zonal averages over the entire Pacific, and used BP far North of the core of the ACC. Here, we will reassess the study of Zlotnicki et al, by using the actual position of the ACC from 2003 to 2009 and smaller zonal boxes on either side of the core position. The ACC position will be determined using data from the Ocean Surface Current Analyses - Realtime (OSCAR) project. Preliminary results will be presented.

Program Start Date: Fall 2010
PhD, expected 2015/2016
Advisor: Dr. Don P. Chambers
Satellite Oceanography Lab
Concentration: Physical Oceanography

Optical Properties of Various Materials and Organisms in the Ocean

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Various materials and organisms exist in the surface ocean, which are all important to the marine ecosystems. Yet their quantification is often difficult due to limitations of the existing techniques. For example, garbage patches have been located in all the major ocean gyres where currents trap large amounts of plastics, fishing equipment and other consumer products. However, the spatial distribution of these marine "garbage" is unknown, not to mention how they change over time. On the other hand, oil spills and toxic red tide blooms often occur in coastal oceans, yet differentiating their occurrences from other ocean phenomena is often challenging. This project's focus is on determining the spectral reflectance and absorption properties of various materials and phytoplankton types, including ocean garbage, oil slicks, and toxic and non-toxic algae. Some of the works have been done, while others will be continued in the coming months. First, we used a Spectrix radiometer to measure the spectral reflectance of manmade garbage. Many factors can adversely affect the reflectance measurements, such as sun glint, sun angle, cloudiness and measurement angle. Caution was used to follow protocols and to quality control the reflectance data. The next step is to place the garbage in Bayboro harbor off the seawall at USF College of Marine Science to measure the reflectance of garbage in a realistic ocean environment, and then compare with a spectral library from the USGS. Various algae samples will be made available by the Florida Fish and Wildlife Research Institute. These samples will be filtered in the lab to determine the spectral absorption of various algae (toxic and non-toxic) to understand their difference and similarity. Oil slicks in satellite imagery from known locations (e.g., the Deepwater-Horizon oil spill) will be analyzed for their optical properties. The ultimate goal of this work is to differentiate and quantify the various floating materials and marine algae using optical means and to provide the basis for future remote sensing work.

Program start date: Fall 2010
MS, expected spring 2012
Advisor: Dr. Chuanmin Hu
Optics Laboratory
Concentration: Biological Oceanography

Influence of Temperature on Yolk-Sac Resorption of *Centropomus undecimalis* Larvae in a Controlled Laboratory Environment

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[1]College of Marine Science, University of South Florida; [2]Center for Aquaculture Research and Development, Mote Marine Laboratory

In an effort to determine the optimal temperature for rearing snook larvae during the yolk Resorption period, three temperatures (25 ºC, 28 ºC and 31 ºC**)** are being tested. Incubation occurred at 28 ºC water in the three systems until hatching, about 17 hours post-fertilization. Once hatching occurred, temperatures where adjusted to the respective treatment temperatures. Measurements were collected from individual larvae over time and across rearing temperatures at pre-determined time intervals: T0 (hatch), T1 (24 hours post hatch [hph]), T2 (48 hph), T3 (72 hph). At each interval 25 individuals were sampled from each treatment. Using a Microscope and a digital camera the larvae were photographed and measurements included yolk sac length and height, oil globule diameter, standard length, body height at anal pore and eye diameter were extracted. Rearing systems were set in shallow rectangular raceways supplied with re-circulating water. Each raceway contained 25 microcosms randomly distributed on an elevated platform that allowed the water to flow around and under each microcosm. Temperature loggers were immersed in each system in order to record temperature every 15 minutes to verify the actual temperatures during the rearing trials. Larvae with higher standard length and slower yolk consumption seem to be rear at 25 ºC system.

Program start date: Fall 2009
MS, expected 2011
Advisor: Dr. Frank Muller-Karger
Institute for Marine Remote Sensing (ImaRS)
Concentration: Biological Oceanography

Investigation of Carbon, Nutrients, and Groundwater Inputs in Coastal Florida Using Colored Dissolved Organic Matter

Ana R. Arellano[1], Paula G. Coble[1] and Robyn N. Conmy[2]

[1]College of Marine Science, University of South Florida; [2] Environmental Protection Agency

Very few studies of the exchange of water between aquifers and the ocean have been conducted along the Florida coast. Nutrient concentration in coastal groundwater is sometimes higher than those in river water, counterbalancing for the lower mass flux of groundwater relative to surface waters. Nutrient and carbon inputs through groundwater in certain areas may play an important role in cycling and primary productivity in the coastal ocean.

King's Bay is a spring-fed watershed and manatee sanctuary located on the West Florida Shelf. Over the past 25 years, springs supplying groundwater to King's Bay have shown a three-fold increase in nitrate concentration and increased invasion of nuisance algae. It has been challenging to track sources of both nutrients and other water quality parameters because there are multiple water supplies to King's Bay. The goal of this project is to improve the estimate of water, nutrients, and carbon from groundwater discharge into the coastal zone. This paper will present preliminary results of high resolution fluorescence spectroscopy analyses of the various source water types in the King's Bay watershed, including deep and shallow aquifers, wells, springs, and surface water sources.

Samples were obtained from various sites--5 springs, 27 wells, 12 surface, and 9 lakes and rivers-- within the King's Bay area during one dry season. Lakes and rivers had the highest fluorescence intensities and showed similar composition, with the most red-shifted emission maxima. Second highest concentration was seen in some of the wells which had wide range in both composition and intensities. Springs samples were all similar in composition, with concentrations in middle range found in well samples. These results will be discussed in reference to determination of source of water, carbon, and nutrients to the springs.

Program Start Date: Fall 2009
MS, expected Spring 2011
Advisor: Dr. Paula G. Coble
Marine Spectroscopy Laboratory
Concentration: Chemical Oceanography

Defining Fish Nursery Habitats of *Centropomus undecimalis* Using Otolith Elemental Fingerprinting

Holly Rolls[1], Ernst Peebles[1], David Jones[1], Carole McIvor[2] and Janet Ley[3]

[1]College of Marine Science, University of South Florida; [2]Coastal and Marine Science Center, United States Geological Survey; [3]Florida Fish and Wildlife Research Institute

Common snook (*Centropomus undecimalis*) use tidal creeks and backwaters in mangrove and saltmarsh environments as nursery habitat throughout the Tampa Bay estuary in west-central Florida. The relative contribution of these nursery grounds to the recreational fishery has not yet been quantified. Scientists are increasingly using elemental signatures contained within fish otoliths to identify geographic nursery areas that contribute disproportionately to adult fish stocks, so that resource managers can prioritize the conservation and restoration of these areas. The chemical composition of the otolith acts as a natural tag, reflecting the ambient water chemistry of the juvenile nursery habitat, and can thus be used as an "elemental fingerprint" to distinguish fish from different geographic origins. We are using laser ablation inductively coupled mass spectrometry (LA-ICP-MS) to analyze the elemental fingerprints of 95 young-of-the-year snook otoliths from 16 Tampa Bay tributaries. We will then analyze the juvenile portions of 80 adult snook otoliths from the same cohort in order to match them to their probable nursery areas, as defined by young-of-the-year otoliths. Preliminary tests on juvenile red drum (*Sciaenops ocellatus*), a fish species with a similar life history, have shown that otoliths from fish captured in different geographic locations within the greater Tampa Bay estuary are highly distinctive, with replicate observations clustering together within a Random Forest classification.

Program start date: Fall 2009
MS, expected Summer 2011
Advisor: Dr. Ernst Peebles
Peebles Lab
Concentration: Biological Oceanography

Wavelet analysis of synoptic variability in Tampa Bay, FL

Monica Wilson[1], Steven D. Meyers[1] and Mark E. Luther[1]

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Wavelet analysis is used to quantify the link between the El Nino Southern Oscillation (ENSO) and local synoptic variability in Tampa Bay. Fifty-seven years (1950-2006) of observational data is collected. Used in this study are hourly elevations from the St. Petersburg tide gauge (#8726520) and hourly winds provided by NOAA's Tides and Currents and the National Climatic Data Center. Continuous wavelet analysis over periods of 2 to 20 days (to isolate the synoptic scale) is done on the elevation and u- and v- components of the winds and compared to the ENSO state as defined by the NOAA Oceanic Niño Index (ONI). Long-term seasonal averages (SA) are calculated of the transform amplitude and binned according to the ENSO state. During winter, spring, and summer the SA of the v-component of the winds during El Niño (La Niña) is negative (positive). During the fall El Niño it is positive and during La Niña it is close to 0. During neutral years the SA is close to 0. The SA of the u-component of the winds during El Niño (El Niña) is positive (negative) in the winter, spring, and fall and negative (positive) in the summer. The SA of the elevation follows a very similar pattern to the SA of the u-component of the winds. The strength of the SA for elevation and u- and v-component of the winds are found to be about 10-50% relative to the long-term means.

Program Start Date: Fall 2007
PhD, expected Spring 2012
Advisor: Dr. Mark E. Luther
Ocean Modeling and Prediction Laboratory
Concentration: Physical Oceanography

Developing High-Resolution SST Climatologies and Thermal Stress Indices to Enhance NOAA'S Coral Reef Decision Support System

Maria Vega-Rodriguez[1], Frank Muller-Karger[1], Mark Eakin[2], Liane Guild[3], Chuanmin Hu[1], Jianke Li[2], G.ang Li[2] and Gabriel Quiles-Pérez[1].

[1]College of Marine Science, University of South Florida; [2]Coral Reef Watch program, National Oceanic and Atmospheric Administration (NOAA); [3]NASA Ames Research Center, Earth Science Division.

A collaborative effort between NASA, NOAA, and academia partners has been funded by NASA and NOAA to seek solutions to enhance the NOAA's Coral Reef Watch (CRW) sea surface temperature data products. This project seeks to enhance the NOAA Coral Reef Watch's Decision Support System by assessing the value of SST data from the AVHRR and MODIS satellites at 1 and 4 km spatial resolution; the current decision support system uses 50 km AVHRR products. The NOAA CRW program uses operational, near-real-time SST data to produce SST climatologies and various thermal stress indices as SST anomalies, HotSpots and Degree Heating Weeks (DHW), among other products. Similar thermal stress indices will be generated with high-resolution satellite imagery. These will help monitor and forecast coral reef bleaching events around the world. Preliminary HotSpots and DHW have been developed using the USF 1 km local area coverage (LAC) for the West Florida Shelf. Additional test imagery will be developed for the Florida Keys and Caribbean regions for application and ground truthing in collaboration with regional coral reef researchers.

Program start date: Spring 2010
PhD, expected Summer 2014
Advisor: Dr. Frank Muller-Karger
Institute for Marine Remote Sensing (ImaRS)

Spatial and Temporal Variability of Red Grouper Habitat within Steamboat Lumps Marine Reserve, Gulf of Mexico

Carrie C. Wall[1], Brian T. Donahue[1], David F. Naar[1] and David A. Mann[1]

[1]University of South Florida, College of Marine Science

Red grouper, *Epinephelus morio*, act as keystone species by excavating depressions (or holes) in areas of flat sandy bottom, which provides suitable habitat for themselves and for numerous other species. In 2006 and 2009, high resolution multibeam sonar data were collected in overlapping areas within the Steamboat Lumps Marine Reserve in the eastern Gulf of Mexico. Vertical profiles of the holes visually identified from the multibeam datasets were extracted to characterize the hole shape and determine how the deepness, width and slope of each hole changed over time and space. The density of holes increased from 110 to 141 holes per km^2 from 2006 to 2009 with 181 holes detected in 2006 and 231 holes detected in 2009. Additionally the deepness and slope increased between 2006 and 2009. The changes in these parameters and the 151 holes identified in the same location between the years suggest hole shape is varied due to maintenance by red grouper and supports the notion that holes are constructed and maintained over time. The increase in number and density of holes from 2006 to 2009 supports the efficacy of marine reserves and furthers the need for multiyear habitat mapping as a method to monitor the presence and extent of red grouper spawning populations.

Program Start Date: Fall 2008
PhD, expected Spring 2012
Advisor: Dr. David Mann
Marine Sensory Laboratory
Concentration: Biological Oceanography

High Precision Carbon System Measurements: Methods, Improvements, and Polar Bears

Mark C. Patsavas[1], Robert H. Byrne[1] and Xuewu Liu[1]

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Spectrophotometric measurements of seawater pH based on characteristics of indicating dyes have proven to be robust and precise on the order of 0.0004 pH units. Impurities in the indicating dye meta-Cresol Purple (mCP) can introduce systematic errors in the pH measurement and can result in pH differences as large as 0.015 pH units. Using high performance liquid chromatography, mCP has been purified, and the pH measurement characteristics of purified mCP have been determined over a wide range of salinity and temperature.

Because of the precision of the measurement, pH can be used to quality control other CO_2-system parameters via thermodynamic calculations, and an autonomous flow-through Multi-parameter Inorganic Carbon Analyzer (MICA) has been developed to measure pH, CO_2 fugacity, and total carbon. The purified mCP and autonomous MICA were taken to the Arctic Ocean in August 2010 where baseline high resolution CO_2-system data (and awesome photos) were obtained to be used in the future to determine ocean acidification rates.

Program Start Date: Fall 2009
PhD, expected Summer 2014
Advisor: Dr. Robert H. Byrne
CO_2 Sensors Lab
Concentration: Chemical Oceanography

Thermal Determinants of Nest Site Selection in Loggerhead Turtles, *Caretta caretta,* at Casey Key, Florida

Lindsey Flynn[1], Edward Van Vleet[1], Tony Tucker[2] and Deby Cassill[3]

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Adult female loggerhead sea turtles emerge onto a nesting beach multiple times per nesting season to select nest sites. Presently, it is unknown what reliable mechanisms a female can employ to select a nest site while operating temporarily in this alien terrestrial environment.

Nesting beach characteristics were evaluated in relation to nest site selection by loggerhead turtles at a non-nourished beach of Casey Key, Florida from May through August in the 2008 and 2009 seasons. We recorded the presence or absence of rain, wind, clouds, sand coarseness and sand wetness. Thermal data were collected with both a laser thermometer and thermoprobe thermometer. Thermal beach profile data were obtained from the water, waterline, beach sand, body pit, nest chamber, eggs, and gular skin of nesting females for measurements along, and one meter adjacent to the actual crawl track. Beach slope was determined with an angle locator.

Beach slope was minimal and had no effect on beach thermal profiles or nest site selection. While rain and wind did not significantly affect beach temperatures, cloud cover did and therefore may influence nesting behavior. There was a significant thermal difference between wet and dry sand, dry sand and shell debris, and between the water and several locations along the width of the beach. While the temperature of turtle eggs was significantly different from the body pit, nest chamber and gular skin of the adult turtle, the latter three thermal measurements were not significantly different from each other.

Findings suggest that female loggerheads may be matching a sand temperature similar to the gular skin to select a nest location, perhaps by using a technique known as “sand nuzzling”. While this behavior may produce differences in nest site selection, further studies are necessary to determine if these findings are consistent over time and space.

Program start date: Fall 2008
MS, expected Summer 2011
Advisor: Dr. Edward Van Vleet
Concentration: Biological Oceanography

Kinetic Characteristics of LDH in Polar and Subtropical Fishes: a Comparison.

Suzanne Stickley[1] and Jose Torres[1]

[1]College of Marine Science, University of South Florida

My proposed research will examine how the activity of the metabolic enzyme lactate dehydrogenase (LDH) changes with temperature in fish species specifically adapted to cold temperatures. I will first be analyzing three species of Antarctic fishes. The metabolisms of these fish are unique in that they must function at temperatures that are generally unfavorable for efficient enzymatic processes. I will then analyze three analogous Gulf of Mexico species to provide data for comparison. Muscle tissue samples will be analyzed using gel electrophoresis to identify the isoforms of LDH present. Then the LDH enzyme activity of white muscle tissue will be measured using spectrophotometry. The results will be a characterization of LDH in the form of Michaelis-Boltzmann constant plotted with temperature. My proposed research is exciting because little work has been done to analyze critical metabolic enzyme functions of the Antarctic fish that are very specifically adapted to cold, unvarying temperatures.

Program Start Date: Fall 2005
MS, expected Fall 2011
Advisor: Dr. Jose Torres
Physiology Lab
Concentration: Biological Oceanography

Observation and Simulation Study of Two Cold-air Outbreak Snowstorms over Shandong Peninsula of China

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In this paper, the structural and dynamical evolution of two snowstorms that occurred over the north coast of Shandong peninsula on 4-5 (case_1) and 20-21 (case_2) December 2008, respectively, are analyzed. Satellite images, surface observations, soundings, Doppler radar figures, wind profiles show that a mesoscale convergence band is responsible for the snowband oriented in northwest-southeast in case_1, and that a mesoscale cyclone results in dual snowbands parallel to the north coastline of Shandong peninsula in case_2. Wind profiles suggest that the coastal front maintained snowfalls after the mesoscale convergence band or cyclone left Shandong peninsula. Control experiments simulated by the fifth–generation Pennsylvania State University/National Center for Atmosphere Research Mesoscale Model (MM5) well reproduce the characteristics of the two cases. The convergence band in case_1 formed over of the southern Bohai Sea and moved northeastward. The convergence band had a feature of fluctuation due to different moving directions for different parts of the convergence band. When the convergence band landed in the north coast of Shandong peninsula, it coupled with the coastal front and resulted in the snowstorm. The mesoscale cyclone in case_2 moved southeastward from northwest coast of the Bohai Sea. When the center of the mesoscale cyclone landed in Shandong peninsula, it coupled with the coastal front resulting in dual snowbands. Sensitivity experiments indicate that the mesoscale convergence band or the mesoscale cyclone over the Bohai Sea is intensified when going across the leeside of Mount Taihang with northwesterly winds blowing over Mount Taihang. Additionally, surface heat and moisture fluxes from the Bohai Sea and the North Yellow Sea also play an important role.

Program Start Date: Fall 2010
MS, expected Summer 2015
Advisor: Dr. Qingnong Xiao
Data Assimilation Laboratory
Concentration: Physical Oceanography

Gene Transfer Agents' Effect on Coral Larval Settlement

Elizabeth Young[1], John Paul[1], Lauren McDaniel[1], Kim Ritchie[2] and Robert Ulrich1

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Gene Transfer Agents (GTAs) are phage-like particles that are produced by many α-proteobacteria in late stationary phase and are capable of transferring chromosomal genes (termed "constitutive transduction"). Examination of α-proteobacterial genomic sequences indicated widespread occurrence of GTA-like elements. We isolated a *Reugeria* spp (ID 45A6) from cultures of the coral endosymbiotic dinoflagellate, *Symbiodinium* spp., and set out to see if GTAs from this isolate have an impact on settlement of coral larvae. Little is known about coral settlement cues, yet there may be contributions from the extensive symbiotic relationship of coral reef-associated bacteria. Three experiments were performed using GTAs from the *Reugeria* isolate. Two of these experiments used larvae from the brooding coral, *Porites astreoides,* and the other from the reef building coral, *Montastraea faveolata*. Coral planulae (*P. astreoides*) or egg and sperm bundles (*M. faveolata*) were collected and cross fertilized in the Florida Keys during spawning periods. Larvae were exposed to purified GTAs and biofilm slides were used as settlement substrates. There was a significant increase in *P. astreoides* larval settlement as well as *Montastraea* larval settlement when treated with GTAs as compared to the killed GTAs, indigenous viral-like particles, and phage controls. We recently showed that GTA-mediated gene exchange is much higher in a coral reef environment as compared to other marine environments. Furthermore, we showed that these genes can be exchanged between bacterial taxa. GTA-mediated beneficial gene exchange may be an important driver in adaptation to a changing planet.

Program Start Date: Fall 2008
MS, expected Summer 2011
Advisor: Dr. John Paul
Marine Microbiology Lab
Concentration: Biological Oceanography

Electrocoagulation Technology For Removal of Biochemical Contaminants From Wastewater Treatment Plant Samples

Monica M. Cook[1], Edward Van Vleet[1] and Mya Breitbart[1]

[1]College of Marine Science, University of South Florida

Electrocoagulation (EC) is the process of passing an electrical current through water with the goal of removing contaminants from that water. For this research project, the EC unit (Powell Water Systems, Inc.) contains nine iron blades with 110-volt power chords being attached to the first and last blade. Water samples are pumped into the bottom of the unit and discharged at the top. The EC process causes the contaminants to coagulate, making them separable. This is based on both the ionization of the iron anode into charged soluble iron species as well as the iron cathode which produces the hydroxyl radical. The iron hydroxides which subsequently form attract and hold dissolved contaminants in the water matrix. The discharge from the EC unit is collected in a container where the coagulated floc floats on the top. The floc is then isolated by filtration using a Whatman no.1 filter. A trial experiment was conducted in Spring 2010. Two samples of raw sewage were run through the EC unit, and the EC effluent was tested for removal of PMMoV and two bacteriophages (the bacterial host strains being *E.Coli* and *B. subtilis*). In both cases, the contaminants were removed to below detection. Because of these positive preliminary results, the project was expanded to include contaminants of increasing concern, and now involves six different laboratories. For the 2011 experiments, two Wastewater Treatment Plants (WWTP) have agreed to allow our sampling of both raw sewage and effluent. For each WWTP, three carboys will be filled with raw sewage and three will be filled with effluent. The carboys will be brought back to USF for EC processing. Once the samples have been run through the EC, samples will be prepared for analysis from the following six laboratories:

--Breitbart Lab: PMMoV
--Fanning Lab: Nutrients
--Paul Lab: Enterococcus (nucleic acid assay)
--Lukasik Lab, UF: Cryptosporidium, Giardia
--Van Vleet Lab: Estrogen Endocrine Disrupting Compounds
--St. Pete College: *E. coli*, fecal coliforms, Enterococci, human polyomavirus

In our laboratory (Van Vleet Lab), methodology has already been developed for the analyses of four estrogenic endocrine disruptors (estrone, estriol, estradiol and ethinylestradiol) utilizing solid phase extraction, automated sediment extraction and GCMS.

Program Start Date: Fall 2008
PhD, expected Spring 2013
Advisor: Dr. Edward Van Vleet
Marine Organic Geochemistry Laboratory
Concentration: Chemical Oceanography

Assessment of Fertility Potential in the Bottlenose Dolphin (*Tursiops truncatus*): Application of ELISA-based Biomarker Analysis

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Environmental and anthropogenic stressors can affect aquatic organisms in numerous ways, including sublethal effects on fertility. For marine mammals, specifically the bottlenose dolphin (*Tursiops truncatus*), potential stressors have been identified, yet their sublethal effects on vital biological functions remain poorly understood. Several dolphin populations contain elevated contaminant levels (i.e., PCBs and pesticides), but the extent to which body burdens are sufficient to cause adverse effects on immune function, reproduction, and energetic fitness is uncertain. We employed ELISAs of three peptide hormones (inhibin A, inhibin B and anti-Müllerian hormone; AMH) to better understand reproductive potential and changes associated with specific stressors. The use of biomarkers, such as these hormones, ideally allows us to correlate effects on fertility potential with possible causes (i.e., chemical contaminants and disease). This study obtained baseline hormone concentrations in free-ranging dolphins (n=51) from Sarasota Bay and Indian River Lagoon, FL, and then linked those data to known life and reproductive history, nutritional status, and body condition. Significant differences were observed in AMH between sexes (concentrations ranged 546-2,306 ng/mL [mean 1,380 ng/mL] in males and 0.11-5.35 ng/mL [mean 1.93 ng/mL] in females), and male AMH levels were greater in juvenile dolphins, compared to adults. Inhibin B concentrations ranged from 4.32-25.0 pg/mL (mean 8.75 pg/mL) in males and 3.60-59.9 pg/mL (mean 14.8 pg/mL) in females. Overall, inhibin A and AMH averages were slightly higher in Sarasota Bay dolphins, a relatively healthy population. This represents the first record of inhibin A, inhibin B, and AMH detection in bottlenose dolphins. Knowledge gained from this research may help clarify conservation status and focus mitigation and conservation actions for marine mammal populations.

Program Start date: Fall 2009
MS, expected Fall 2011
Advisors: Dr. Ted Van Vleet & Dr. Kendra Daly
Mote Marine Laboratory, Aquatic Toxicology and Biomarker Lab
Concentration: Chemical and Biological Oceanography

Controls of Heavy Metal Distribution in the Manatee River Watershed, FL over the last one-hundred years

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The Manatee River Watershed, which drains into southeast Tampa Bay, Florida, has been subject to rapid agricultural and urban development over the past one hundred years. This project explores the distribution of the heavy metals (As, Pb, Cu) associated with the anthropogenic development during that period. Sediment cores were collected near the mouth of the Manatee River in different sedimentary depocenters such as mangrove swamp, salt marsh, restricted marine and fluvial environments. These cores were dated using $^{210}Pb/^{137}Cs$ methods and heavy metal enrichment factors were also determined by ICP-MS. The primary carrier, depocenter environment and accumulation rate/enrichment factor were determined for each metal. Knowledge of the distribution patterns as well as the baselines for each of these metals is essential to future watershed health and management.

Program start date: Fall 2007
PhD, expected Fall 2011
Advisor: Dr. Ashanti Johnson
Radiogeochemistry Lab
Concentration: Geological Oceanography

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